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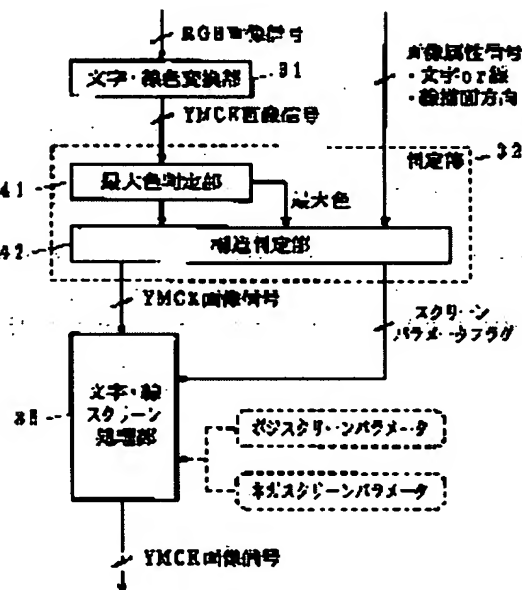
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## (54) IMAGE PROCESSOR, IMAGE FORMING DEVICE, AND RECORDING MEDIUM

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an image processor that prevents thin lines from being missing due to screen processing so as to reproduce an image in an excellent way.

SOLUTION: A character/line color conversion section 31 applies color material color conversion to a rasterized image signal, and a maximum color discrimination section 41 identifies a maximum color among colors of color materials reproducing a color of line segments. A structure discrimination section 42 outputs a screen parameter flag to control a screen parameter so that a character/line screen processing section 35 can conduct screen processing of the maximum color at a screen angle different from a drawing direction of the line segments based on the identified maximum color and the drawing direction of the line segments. The character/line screen processing section 35 uses the screen parameter at a different screen angle from the drawing direction of the line segments according to the screen parameter flag to apply screen processing to the image. Thus, missing of the line segments due to the screen processing can be avoided.



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**CLAIMS**

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[Claim(s)]

[Claim 1] A maximum color specification means to specify a color which should avoid disappearance from among colors of two or more color material used in order to reproduce a color of this segment about a segment which constitutes an input image as the maximum color, Said maximum color specified with said maximum color specification means, and a structure judging means to control a screen parameter according to the drawing direction of said segment, It has a screen treatment means to perform screen treatment according to said screen parameter controlled by said structure judging means. Said structure judging means An image processing system characterized by controlling said screen parameter so that screen treatment of said maximum color is performed at a different screen angle from the drawing direction of said segment in said screen treatment means.

[Claim 2] A maximum color specification means to specify a color which should avoid disappearance from among colors of two or more color material used in order to reproduce a color of this segment about a segment which constitutes an input image as the maximum color, Said maximum color specified with said maximum color specification means, and a structure judging means to control a screen parameter according to the drawing direction of said segment, It has a screen treatment means to perform screen treatment according to said screen parameter controlled by said structure judging means. Said structure judging means An image processing system characterized by controlling said screen parameter so that screen treatment of said maximum color is performed at a screen angle which is different from a screen angle to a segment of others and the drawing direction when the drawing direction of said segment is the predetermined direction.

[Claim 3] Said structure judging means is an image processing system according to claim 1 or 2 characterized by performing a judgment of whether said segment is a segment thinner than predetermined width of face in case said screen parameter is controlled.

[Claim 4] Said structure judging means is an image processing system given in any 1 term of claim 1 characterized by performing a judgment of whether said segment is a segment with concentration thinner than predetermined concentration in case said screen parameter is controlled thru/or claim 3.

[Claim 5] Said maximum color specification means is an image processing system given in any 1 term of claim 1 characterized by giving priority to other colors over yellow in the case of the specification of said maximum color thru/or claim 4.

[Claim 6] Said screen treatment means is an image processing system given in any 1 term of claim 1 characterized by control of said screen parameter constituting screen treatment by the same resolution and two or more screen angles of the number of lines selectable thru/or claim 5.

[Claim 7] Said screen treatment means is an image processing system given in any 1 term of claim 1 characterized by control of said screen parameter constituting either of the screen angles which have a mirror image relation mutually selectable thru/or claim 6.

[Claim 8] Said structure judging means is an image processing system given in any 1 term of claim 1 characterized by controlling a screen parameter for every segment thru/or claim 7.

[Claim 9] Said structure judging means is an image processing system given in any 1 term of claim 1 characterized by synthesizing a judgment result for every segment and controlling a screen parameter to an input image thru/or claim 7.

[Claim 10] A maximum color specification means to specify a color which should avoid disappearance from among colors of two or more color material used in order to reproduce a color of this segment about a segment which constitutes an input image as the maximum color, Said maximum color specified with said maximum color specification means, and a structure judging means to control a screen parameter according to the drawing direction of said segment, A screen treatment means to perform screen treatment according to said screen parameter controlled by said structure judging means, It has an image formation means to form an image after said screen treatment means performs screen treatment on image formation data medium. Said structure judging means Image formation equipment characterized by controlling said screen parameter so that screen treatment of said maximum color is performed at a different screen angle from the drawing direction of said segment in said screen treatment means.

[Claim 11] A maximum color specification means to specify a color which should avoid disappearance from among colors of two or more color material used in order to reproduce a color of this segment about a segment which constitutes an input image as the maximum color, Said maximum color specified with said maximum color specification means, and a structure judging means to control a screen parameter according to the drawing direction of said segment, A screen treatment means to perform screen treatment according to said screen parameter controlled by said structure judging means, It has an image formation means to form an image after said screen treatment means performs screen treatment on image formation data medium. Said structure judging means Image formation equipment characterized by controlling said screen parameter so that screen treatment of said maximum color is performed at a screen angle which is different from a screen angle to a segment of other drawing directions when the drawing direction of said segment is the predetermined direction in said screen treatment means.

[Claim 12] Said structure judging means is image formation equipment according to claim 10 or 11 characterized by performing a judgment of whether said segment is a segment thinner than predetermined width of face in case said screen parameter is controlled.

[Claim 13] Said structure judging means is image formation equipment given in any 1 term of claim 10 characterized by performing a judgment of whether said segment is a segment with concentration thinner than predetermined concentration in case said screen parameter is controlled thru/or claim 12.

[Claim 14] Said maximum color specification means is image formation equipment given in any 1 term of claim 10 characterized by giving priority to other colors over yellow in the case of the specification of said maximum color thru/or claim 13.

[Claim 15] Said screen treatment means is image formation equipment given in any 1 term of claim 10 characterized by control of said screen parameter constituting screen treatment by the same resolution and two or more screen angles of the number of lines selectable thru/or claim 14.

[Claim 16] Said screen treatment means is image formation equipment given in any 1 term of claim 10 characterized by control of said screen parameter constituting either of the screen angles which have a mirror image relation mutually selectable thru/or claim 15.

[Claim 17] Said structure judging means is image formation equipment given in any 1 term of claim 10 characterized by controlling a screen parameter for every segment thru/or claim 16.

[Claim 18] Said structure judging means is image formation equipment given in any 1 term of claim 10 characterized by synthesizing a judgment result for every segment and setting up a screen parameter to an input image thru/or claim 16.

[Claim 19] The maximum color specification step which specifies a color which should avoid disappearance from among colors of two or more color material used in order to reproduce a color of this segment about a segment which constitutes an input image as the maximum color, A structure judging step which controls said screen parameter so that screen treatment of said maximum color is performed at a different screen angle from the drawing direction of said

segment according to the drawing direction of said maximum color and said segment, A storage which said computer characterized by having memorized a program which makes a computer perform a screen treatment step which performs screen treatment according to said controlled screen parameter can read.

[Claim 20] The maximum color specification step which specifies a color which should avoid disappearance from among colors of two or more color material used in order to reproduce a color of this segment about a segment which constitutes an input image as the maximum color, A structure judging step which controls said screen parameter so that screen treatment of said maximum color is performed at a screen angle which is different from a screen angle to a segment of others and the drawing direction when the drawing direction of said segment is the predetermined direction, A storage which said computer characterized by having memorized a program which makes a computer perform a screen treatment step which performs screen treatment according to said controlled screen parameter can read.

[Claim 21] A storage according to claim 19 or 20 characterized by using in case it judges further whether said segment is a segment thinner than predetermined width of face and a result of this judgment also controls said screen parameter in said structure judging step.

[Claim 22] A storage given in any 1 term of claim 19 characterized by using in case a judgment of whether said segment is a segment with concentration thinner than predetermined concentration is also performed and a result of this judgment also controls said screen parameter further in said structure judging step thru/or claim 21.

[Claim 23] A storage given in any 1 term of claim 19 characterized by giving priority to other colors over yellow in said maximum color specification step in case said maximum color is specified thru/or claim 22.

[Claim 24] A storage given in any 1 term of claim 19 characterized by choosing screen treatment by the same resolution and two or more screen angles of the number of lines by control of said screen parameter at said screen treatment step thru/or claim 23.

[Claim 25] A storage given in any 1 term of claim 19 characterized by choosing either of the screen angles which have a mirror image relation mutually by control of said screen parameter at said screen treatment step, and performing screen treatment thru/or claim 24.

[Claim 26] A storage given in any 1 term of claim 19 characterized by controlling a screen parameter by said structure judging step for every segment thru/or claim 25.

[Claim 27] A storage given in any 1 term of claim 19 characterized by synthesizing a judgment result for every segment and controlling a screen parameter to an input image by said structure judging step thru/or claim 25.

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[Translation done.]

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2004/03/19 15:21

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cc:  
件名: 本日の件

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**DETAILED DESCRIPTION**

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[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] This invention relates to the storage which remembered the program which makes a computer perform such processing to be the image processing system and image formation equipment which perform screen treatment to an input image.

[0002]

[Description of the Prior Art] With the image formation equipment of a color, full color color reproduction is realized using two or more color material. In case a color picture is formed, the image of a color which corresponds for every color material will be formed in piles. In case the image of each color is piled up, gap of some may arise on precision. The gap in the case of superposition will cause generating of moire etc. on an image.

[0003] In order to prevent generating of the moire resulting from superposition gap of the image of such each color etc., generally the rotation screen into which the screen angle at the time of the screen treatment to an image is changed for every color-material color is used. The screen angle at the time of a rotation screen is designed so that moire may not occur. In that case, as a screen configuration, there are a dot configuration, a line configuration, and a distributed configuration, a dot configuration is the flexibility of 90 degrees about a screen angle, and, as for a line configuration, a screen angle can be designed with the flexibility of 180 degrees. Generally, the line configuration where the flexibility of layout is large is used.

[0004] On the other hand, generally in the image for every color-material color, the halftone dot area method of a screen is expressing the shade. It is the method of making the shade in the whole image appearing, by changing the drawing-surface product in the minute field of predetermined magnitude by this halftone dot area method according to the concentration gradation which draws. For example, in a light portion, only 1 in a minute field thru/or several points will be drawn, and when such points are scattered, gradation light as the whole image will be expressed.

[0005] however -- since the field drawn by the predetermined pattern and the field which is not drawn will appear by turns, if it is a part in a minute field very much, and being drawn in the case of a light color tends to draw the thin line of a light color. Interference will occur between a thin line and a drawing pattern. In a thin line with the light angle close to especially a screen angle, a thin line was not drawn in many minute fields which continue in the extension direction of a thin line, but there was a problem that a thin line light as the whole image will disappear. It is easy to generate disappearance of such a line, so that it is insensitive, and, so that it is a light color and is the line of the angle still nearer to a screen angle.

[0006] For example, in JP,9-191403,A, a line drawing is detected from the inputted picture signal, and changing to a screen with high resolution and gamma conversion for gradation amendment is indicated about the portion of a line drawing. However, by this reference, in order to think the gradation nature of portions other than a line drawing as important and to think resolution as important about a line drawing, a screen configuration, screen ruling, etc. are only changed, and disappearance of a thin line etc. is not prevented. In order to prevent disappearance of a light

thin line by using the screen of high resolution like this reference, if resolution is not raised to the degree of elementary-resolution image, 100% of evasion is impossible, and the color repeatability of a thin line will fall extremely in that case.

[0007] Moreover, for example by JP,9-282471,A, in the controller, the feature for every pixel is acquired from the information described by PDL, and the purport which performs an image processing for every feature of the is indicated. A TEXT signal flag is formed especially in the object which needs resolution, such as an alphabetic character, a line drawing, and an outline, and an image processing is changed to it. However, as it said that 400 lines were performed to the picture signal to which the TEXT signal flag was added about screen treatment, and screen treatment of 200 lines was performed to others, it is only only changing resolution. Thus, disappearance of the above thin lines cannot be prevented only by changing resolution.

[0008] Furthermore, for example by JP,9-294208,A, an edge is detected from the picture signal inputted into the image processing system, and changing two or more screen patterns of the same mask size is indicated according to the condition of an edge. Especially except the edge, a gradation rendering is stabilized with a dot mold and the edge is smoothed in a different screen configuration at the edge section. By this, the backlash in the edge section of an alphabetic character or a line can be smoothed. However, to a case so that the thin line of the angle near a screen angle may disappear also in this case, it is ineffective, and disappearance of a thin line cannot be prevented.

[0009]

[Problem(s) to be Solved by the Invention] This invention was made in view of the situation mentioned above, prevents disappearance of a thin line, and aims at offering an image processing system reproducible good and image formation equipment, and the storage which stored the program which makes a computer perform such an image processing.

[0010]

[Means for Solving the Problem] In this invention, a color which should avoid disappearance from from among colors of two or more color material used in order to reproduce a color of the segment is first specified as the maximum color about a segment which constitutes an input image. And a screen parameter is controlled according to the drawing direction of the maximum color and segment. At this time, a screen parameter is controlled so that screen treatment of the maximum color is performed at a different screen angle from the drawing direction of a segment. If this performs screen treatment according to a controlled screen parameter, since screen treatment will be performed at a screen angle which is different from the drawing direction of a segment about the maximum color at least, disappearance of a thin line, a line with a thin color, etc. can be prevented.

[0011] Or when the drawing direction of a segment is the predetermined direction, a screen parameter is controlled so that screen treatment of the maximum color is performed at a different screen angle from a screen angle to a segment of other drawing directions. At the usual screen angle, about a segment of the drawing direction which is easy to disappear, since screen treatment is performed at a different screen angle from other segments about the maximum color at least by this, by it, disappearance of a thin line, a line with a thin color, etc. can be prevented.

[0012] As mentioned above, when width of face of a segment is thick, it seldom generates, and disappearance of a thin line is seldom generated, when a color is deep. Therefore, modification of such a screen angle is good to carry out, when a segment is a segment thinner than predetermined width of face, or when the drawing direction of a segment is close to a screen angle corresponding to the maximum color about a case where a segment is a segment with concentration thinner than predetermined concentration. Moreover, since yellow is seldom conspicuous, in case it specifies the maximum color so that disappearance may be prevented about a color in which others are conspicuous, it can be constituted so that priority may be given to other colors over yellow. Furthermore, modification of a screen angle can be easily constituted, if either of the screen angles which have a mirror image relation mutually is chosen. Moreover, a screen angle to choose can prevent image quality deterioration of an extreme gradation change, a concentration gap in a modification location, etc. by choosing in the same

resolution and the number of lines.

[0013] In addition, a change of a screen angle can be made for every segment, or a judgment result for every segment can be synthesized, and it can set up about the whole input image.

[0014]

[Embodiment of the Invention] The outline block diagram showing an example of the image formation system by which drawing 1 includes one gestalt of operation of the image formation equipment of this invention, and drawing 2 are the block diagrams showing an example of image formation equipment including one gestalt of operation of the image processing system of this invention. the inside of drawing, and 1 -- a host computer and 2 -- a printer and 3 -- a network and 11 -- application and 12 -- a driver and 21 -- for a color and the gradation amendment processing section, and 24, as for the printer engine section and 26, the screen treatment section and 25 are [ the image-processing section and 22 / the rasterization processing section and 23 / a laser actuator and 27 ] the marking sections. In addition, in this example, the example containing the image processing system of this invention is in the image formation equipment of this invention by example.

[0015] The image formation system shown in drawing 1 consists of a host computer 1 and a printer 2, and both are connected by the network 3. Moreover, the image which should be formed may be sent from devices, such as other computers, through this network 3. Furthermore, the image which should be formed may be sent through communication lines, such as the telephone line which is not illustrated.

[0016] In this example, the driver 12 for changing the application 11 which creates a document, an image, etc., and the image formed in a printer 2 into the format that a printer 2 can be interpreted, and transmitting it to a printer 2 is formed in the host computer 1. The manuscript drawn up with application 11 is transmitted to a driver 12, when the image formation to a record-medium-ed top is needed. The manuscript transmitted to the driver 12 is changed into a Page Description Language (PDL). In description by this Page Description Language, the attribute information on that object is added with the information on the image (object) which should be formed actually.

[0017] The printer 2 has the image-processing section 21 and the printer engine section 25. The image-processing section 21 interprets the Page Description Language sent from a host computer 1, performs various kinds of image processings, and generates the picture signal which can form the best image in the printer engine section 25. At this time, the optimal image processing for the image of each attribute is performed according to the image attribute signal similarly sent from a host computer 1. The printer engine section 25 forms an image on a record medium-ed actually.

[0018] Of course, the data sent to a printer 2 from a host computer 1 may be the raster image which was read not only with the data described by PDL etc. but with the image reader etc., or was stored in the file. In addition, what is necessary is in the case of a raster image, just to constitute so that the analysis means of a raster image may be established instead of the rasterization processing section 22 which sends the information which shows the attribute of each drawing object from a host computer 1, or is later mentioned in a printer 2 and attribute information may be generated. In the following explanation, the data sent to a printer 2 from a host computer 1 shall be PDL as an example.

[0019] The data described by PDL sent to the printer 2 is interpreted in the rasterization processing section 22, and a raster image is formed. At this time, about each object, classification, such as an alphabetic character, a line, a photograph, and graphics, and the attribute signal which includes the information on the drawing direction etc. if it is a line are generated, and it outputs to a color, the gradation amendment processing section 23, the screen treatment section 24, etc.

[0020] In a color and the gradation amendment processing section 23, color conversion to the YMCK color space which is a color space which consists of a color (henceforth, color-material color) of the color material used in the printer engine section 25 from the RGB color space which is a color space of PDL inputted from application 11 using the optimal color correction factor for each attribute according to the signal of the attribute sent from the rasterization

processing section 22, and various kinds of amendment processings, such as gradation amendment processing, are performed. In especially this color and gradation amendment processing section 23, about a segment, judgment of a screen angle which is mentioned later, assignment of a screen angle to the following screen treatment section 24, etc. are performed, and disappearance of a thin line, the line of a thin color, etc. is prevented.

[0021] In the screen treatment section 24, screen treatment is performed after the processing in a color and the gradation amendment processing section 23 according to the property of the printer engine section 25. Of this screen treatment, the halftone dot image processed by the area gradation modulation technique for every color-material color is formed. Also in this screen treatment section 24, screen treatment is performed using the optimal screen coefficient for each attribute according to the signal of the attribute sent from the rasterization processing section 22.

[0022] A halftone dot image is sent to the printer engine section 25. When the printer engine section 25 is a laser electrophotography method, it is constituted by the marking section 27 which has the laser actuator 26 and each part, such as electrification, development, an imprint, and fixation, a laser beam is controlled by the laser actuator 26, a latent image is formed and developed in the marking section 27, and an image is formed on a record medium-ed.

[0023] Drawing 3 is the block diagram showing an example of the image-processing section. the inside of drawing, and 31 -- for a photograph color converter and 34, as for an alphabetic character and the line screen treatment section, and 36, a graphics color converter and 35 are [ an alphabetic character and a \*\*\*\* converter, and 32 / the judgment section and 33 / the photograph screen treatment section and 37 ] the graphics screen treatment sections. The image-processing section 21 will process for every attribute of each object, if a Page Description Language is received. In the rasterization processing section 22, it rasterizes about each object and a color and the gradation amendment processing section 23 are passed by making information on the attribute into an image attribute signal. In drawing 3, in order to simplify explanation, the flow of processing is divided and illustrated for every attribute.

Moreover, three kinds, an alphabetic character and a line, a photograph, and graphics, are shown as an attribute. Of course, what is necessary is for there to be other attributes and just to be able to distinguish the attribute of a line at least.

[0024] When an attribute is a photograph, after the optimal color transform processing for a photograph is performed in the photograph color converter 33, the optimal screen treatment for a photograph is performed in the photograph screen treatment section 36, and the printer engine section 25 is passed. Similarly, when attributes are graphics, after the optimal color transform processing for graphics is performed in the graphics color converter 34, the optimal screen treatment for graphics is performed in the graphics screen treatment section 37, and the printer engine section 25 is passed.

[0025] It is also the same as when attributes are an alphabetic character and a line, and the optimal color transform processing for an alphabetic character or a segment is performed in an alphabetic character and the \*\*\*\* converter 31. Then, in the judgment section 32, while judging the maximum color of the color-material color for drawing the segment to be the drawing direction of a segment, the screen parameter to the alphabetic character and the line screen treatment section 35 of the screen treatment section 24 is controlled [ the screen angle of the maximum color, and ] from drawing. At this time, a screen parameter is controlled so that the screen angle in the maximum color differs from the drawing direction of a segment. And according to the screen parameter controlled by the judgment section 32, screen treatment is performed in an alphabetic character and the line screen treatment section 35, and the printer engine section 25 is passed.

[0026] In addition, although drawing 3 shows an alphabetic character and the line screen treatment section 35, the photograph screen treatment section 36, and the graphics screen treatment section 37 to the screen treatment section 24 for convenience, a screen parameter is changed and these can be realized with the same screen treatment means. Moreover, the same is said of an alphabetic character and the \*\*\*\* converter 31, the photograph color converter 33, and the graphic color converter 34, a transform coefficient may be changed according to an

attribute, and the configuration for the same color conversion may be shared.

[0027] Drawing 4 is the block diagram showing an example of processing to the segment in the image-processing section. As for 41, the maximum color judging section and 42 are the structure judging sections among drawing. The raster image of the object whose attributes developed in the rasterization processing section 22 are an alphabetic character and a line is inputted into the alphabetic character and the \*\*\*\* converter 31 of a color and the gradation amendment processing section 23 as a picture signal of for example, a RGB color space. And in an alphabetic character and the \*\*\*\* converter 31, amendment processing suitable for an alphabetic character, a segment, etc. is performed, and it changes into the picture signal of the color space which consists of a color-material color used in the printer engine sections 25, such as a YMCK color space, further, for example. The picture signal of for example, the changed YMCK color space is inputted into the maximum color judging section 41 of the judgment section 32.

[0028] Especially in the maximum color judging section 41, the color which should avoid disappearance is specified as the maximum color from from at the time of screen treatment among the colors of each color material used in order to reproduce the color of a segment. Although interference with a screen and a segment may generate which color-material color, it can demonstrate the effect by avoiding disappearance about a most conspicuous color. As the maximum color, when color-material colors are four colors of Y, M, C, and K, for example, it can consider as the color (either of the YMCK(s)) of the largest value among the values of Y, M, C, and K of a segment. For example, (Y, M, C, K), if it is the blue segment of = (0, 30, 20, 0), M (Magenta) color is specified as the maximum color as the maximum color. In addition, in the case of the specification of the maximum color, it is good to give priority to other colors over Y (yellow) color. Y color cannot be conspicuous easily, even if a value is large, and a result with more desirable avoiding disappearance of other colors may be obtained.

[0029] The structure judging section 42 specifies the drawing direction of a segment while checking that they are the alphabetic character and the line attribute from reception and the received attribute signal about reception and the attribute signal further outputted from the rasterization processing section 22 in the information on the maximum color similarly specified in the maximum color judging section 41. while receiving the picture signal of the YMCK color space outputted from the alphabetic character and the \*\*\*\* converter 31 through the maximum color judging section 41. Here, when an attribute is a line, a screen parameter is controlled so that screen treatment of the maximum color is performed according to the maximum color thought to be the drawing direction of the segment from the maximum color judging section 41 at a different screen angle from the drawing direction of a segment in the screen treatment section 24. Or at the time of the predetermined directions, such as a direction where the drawing direction of a segment tends to disappear, for example, a screen parameter is controlled so that screen treatment of the maximum color is performed at a different screen angle from the screen angle to the segment of other drawing directions.

[0030] As mentioned above, if the drawing direction of a screen angle and a segment is near, a possibility that a segment will disappear at the time of screen treatment will become high. If it disappears especially about the maximum color, the segment itself will disappear, or the nonconformity of reappearing by color which is drawn only by other colors and is completely different is generated. Therefore, a screen parameter is controlled so that the screen angle in the maximum color differs from the drawing direction of a segment in the screen treatment performed in an alphabetic character and the line screen treatment section 35 according to the drawing direction of the maximum color and a segment. Or when a segment is drawn in the direction which is easy to disappear, said screen parameter is controlled so that screen treatment of the maximum color is performed at a different screen angle from the screen angle to the segment of other drawing directions in the screen treatment performed in an alphabetic character and the line screen treatment section 35. The structure judging section 42 is outputting the screen parameter flag to an alphabetic character and the line screen treatment section 35 for control of this screen parameter. In addition, when an attribute is an alphabetic character, that is told to an alphabetic character and the line screen treatment section 35 with a screen parameter flag, without performing such a judgment so that screen treatment to an

alphabetic character may be performed. When an alphabetic character and the line screen treatment section 35 use the rotation screen especially, a screen angle changes with each color-material colors. Therefore, about the maximum color received from the maximum color judging section 41, the screen parameter is controlled so that the screen angle differs from the drawing direction of a segment.

[0031] In addition, when a possibility of disappearing by screen treatment as mentioned above is high, the case where a segment is thin, and the case where a color is light are mentioned [\*\*\*\*\*]. Therefore, it can consider as the object which controls the screen parameter which changes the above screen angles, for example from an attribute signal about a segment with the width of face of a segment thinner than predetermined width of face. Moreover, it can consider as the object which controls the screen parameter which changes the above screen angles, for example about a segment with the concentration of a segment thinner than predetermined concentration. Of course, it is also possible to combine these conditions.

[0032] In an alphabetic character and the line screen treatment section 35, while receiving a picture signal through the structure judging section 42, the screen parameter flag similarly sent from the structure judging section 42 is received. And according to control by the screen parameter flag, either of the screen parameters of a different screen angle is chosen, and screen treatment is performed and outputted to a picture signal. Drawing 4 shows two kinds, a POJISUKURIN parameter and a NEGASUKURIN parameter, as a screen parameter chosen, and shows as what chooses either. Of course, three or more kinds of screen parameters may exist selectable.

[0033] Drawing 5 is explanatory drawing of an example of a screen parameter. Since a screen angle is changed, a parameter which serves as a screen angle which has a mirror image relation mutually can be set up. In drawing 5, the thick wire shows the screen angle about two different screen parameters. In the example of the screen parameter shown in drawing 5 (A), it has set up so that the screen angle of Y, C, M, and K may become 150 degrees, 120 degrees, 60 degrees, and 30 degrees, respectively. Moreover, in the example of the screen parameter shown in drawing 5 (B), the screen angle shown in drawing 5 (A) and the screen angle which has a mirror image relation are set up. That is, the screen parameter is set up so that the screen angle of Y, C, M, and K may become 30 degrees, 60 degrees, 120 degrees, and 150 degrees, respectively.

[0034] When the segment drawn in the direction near the screen angle in one screen parameter by changing and using such a screen parameter exists, the drawing direction and screen angle of a segment can be changed by using the screen parameter of another side. Moreover, the screen parameter a screen angle has a mirror image relation can be set up easily.

[0035] Here, the screen parameter of the screen angle which shows the screen parameter of the screen angle shown in drawing 5 (A) to a POJISUKURIN parameter, a call, and drawing 5 (B) is called a NEGASUKURIN parameter, and is shown in drawing 4. In addition, the screen angle to each color shown in drawing 5 is an example, and it is possible to set it as arbitration. Of course, what is necessary is not to be restricted to a screen parameter a screen angle has a mirror image relation mutually, as shown in drawing 5, and just to prepare the group of the screen parameter of arbitration with which screen angles differ selectable.

[0036] The selectable above screen parameters for performing screen treatment to a segment in an alphabetic character and the line screen treatment section 35 are the same resolution and the same number of lines, and are good in it being what has a different screen angle. By this, a big concentration change etc. does not occur but deterioration of image quality can be prevented.

[0037] In addition, although the structure judging section 42 is controlling the screen parameter used in an alphabetic character and the line screen treatment section 35 with a screen parameter flag by the above-mentioned example, the screen parameter itself used not only in this but in an alphabetic character and the line screen treatment section 35 may be transmitted from the structure judging section 42, and a screen parameter may be controlled.

[0038] Drawing 6 is a flow chart which shows an example of the actuation in a color, the gradation amendment processing section, and the screen treatment section. In S51, a color and the gradation amendment processing section 23 judge first the signal of the attribute outputted

from the rasterization processing section 22. As a signal of the attribute outputted from the raster processing section 22 here, they shall be four kinds, an alphabetic character, a line, a photograph, and graphics. When the signal of an attribute is a photograph, in S52, by the photograph color converter 33, color conversion for photographs and processing of color correction are performed, and the screen treatment section 24 performs screen treatment using the screen parameter for photographs in S53. Similarly, when the signals of an attribute are graphics, in S54, by the graphics color converter 34, color conversion for graphics and processing of color correction are performed, and the screen treatment section 24 performs screen treatment using the screen parameter for graphics in S55.

[0039] When the signals of an attribute are an alphabetic character and a line, after performing an alphabetic character, color conversion for segments, and processing of color correction by the alphabetic character and the \*\*\*\* converter 31 in S56, if an attribute judges an alphabetic character or a line and it is an alphabetic character in S57, in S58, screen treatment will be performed using the screen parameter for alphabetic characters in the screen treatment section 24.

[0040] Moreover, when an attribute is a line, in S59, the color (the maximum color) which has the greatest value among the color-material colors which constitute the color of a segment is acquired in the maximum-color judging section 41. For example, if color-material colors are Y, M, C, and K, it will become one of the colors. At this time, priority can be given to other colors over Y color which is seldom conspicuous even if a value is large, and it can also consider as the maximum color. For example, only in the case of Y component, Y is made into the maximum color, and when other color components are contained more than predetermined above the secondary color, even if Y is maximum, the maximum color can be chosen from other colors.

[0041] Next, in S60, the structure judging section 42 judges whether a screen angle is changed from the maximum color and the drawing direction of a segment which were acquired by S59, and it sets up a screen parameter flag so that screen treatment may be performed by the suitable screen angle. And in S61, 24 chooses a screen parameter with the set-up screen parameter flag in the screen treatment section S60, and screen treatment for lines is performed.

[0042] Drawing 7 is explanatory drawing of an example of the setting-out method of the screen parameter in the structure judging section. The setting-out method in the case of setting up a screen angle is indicated [ of the segment ] from drawing to be the maximum color acquired in the maximum color judging section 41, in the example shown in drawing 7, the "positive" of the column of a screen parameter shows the case where the POJISUKURIN parameter shown in drawing 5 (A) is chosen, and the "negative" shows in it the case where the NEGASUKURIN parameter shown in drawing 5 (B) is chosen. For example, when M color is acquired as the maximum color in the maximum color judging section 41, if a POJISUKURIN parameter as shown in drawing 5 (A) is used when the drawing direction of a segment is an upward slant to the right, a screen angle and the drawing direction will become near. Therefore, it is possible that the component of M color disappears among segments. Since M color is the maximum color, if this color component disappears, a segment will almost disappear, or a difference of a big color will generate it. A NEGASUKURIN parameter is chosen in order to prevent this. By this, as shown in drawing 5 (B), since it becomes 120 degrees and the lower right serves as \*\*, even if the screen angle of M color performs screen treatment by the screen treatment section 24, disappearance of a segment does not occur and it can reproduce a segment good. Since a screen angle and the drawing direction become near with the NEGASUKURIN parameter shown in drawing 5 (B) when the drawing direction of a segment is a left riser at reverse, disappearance of the segment in the maximum color is prevented using the POJISUKURIN parameter shown in drawing 5 (A). The same is said of other maximum \*\*\*\*\*.

[0043] Thus, from drawing, a screen parameter can be set [ the maximum color and / of a segment ] up so that a segment may not disappear. Disappearance of the segment by interference with the segment and screen treatment which draw is avoidable with this. Moreover, good color reproduction can be realized, without a gap occurring in the abrupt change and change location of a gradation rendering by using it at this time, changing the screen of the same screen ruling. Furthermore, since the change is unnecessary about various kinds of processings,

such as color conversion, gamma correction processing, etc. in a color and the gradation amendment processing section 23, cost can be reduced and lowering of performance can be controlled. In addition, although a screen angle and the drawing direction of a segment may become near except the maximum color, effect is small rather than the maximum color disappears.

[0044] Either which needs to perform selection of a screen parameter as shown in drawing 7 to no segments, for example, is beforehand shown in drawing 5 is chosen, and when the width of face of a segment is below concentration predetermined [ predetermined ] in the case of the selling price, or the color of a segment, it can constitute so that selection as shown in drawing 7 may be performed. For example, the width of face of a segment can make the segment of 0.25 or less points applicable [ of a screen parameter ] to selection.

[0045] Moreover, a selectable screen parameter can prepare the screen parameter with which screen treatment by the screen angle which angles other than the angle at which a segment disappears besides the mirror image relation shown in drawing 5 were made to rotate is performed. For example, 90 degrees or the screen angle rotated 270 degrees may be adopted. A screen configuration can apply various screen configurations, such as a dot screen besides the line screen which is arbitrary and is easy to control a screen angle.

[0046] Drawing 8 is the block diagram showing an example of a host computer including one gestalt of operation of the image processing system of this invention. The sign in drawing is the same as that of drawing 1 and drawing 2 , and the overlapping explanation is omitted. This example shows the example which built the image processing system of this invention into the driver 12 of a host computer 1.

[0047] The manuscript drawn up with application 11 is transmitted to a driver 12, when the image formation to a record-medium-ed top is needed. If a manuscript is transmitted to a driver 12, a driver 12 will perform various processings for forming an image by the printer 2. As a part of the processing, rasterizing processing in the rasterization processing section 22, color transform processing in a color and the gradation amendment processing section 23, gradation amendment processing, the screen treatment in the screen treatment section 24, etc. are performed in the image-processing section 21. In such processing, the maximum color is acquired about a segment as mentioned above, a screen parameter is controlled from the maximum color and drawing direction of a segment, and screen treatment is performed at a different screen angle from the drawing direction of a segment in the screen treatment section 24. Thus, the image with which screen treatment was performed is transmitted to a printer 2.

[0048] Raster data will be transmitted to a printer 2 from a host computer 1 at the case of this configuration. Although it may transmit through a network 3 as shown in drawing 1 , of course, probably, especially in a configuration which a host computer 1 and a printer 2 link directly with a cable, for example using various kinds of parallel interfaces and serial interface, it will be effective.

[0049] In drawing 2 , the whole image-processing section 21 was formed in the printer 2 side, and it prepared in the driver 12 of a host computer 1 in drawing 8 . Not only these examples but the configuration of forming a part of image-processing section 21 in the driver 12 of a host computer 1, and preparing other portions in a printer 2 is possible for this invention. For example, it is also possible to form the screen treatment section 24 even for a color and the gradation amendment processing section 23 in a printer 2 at a driver 12. In this case, what is necessary is just to transmit to a printer 2 from a host computer 1 also about a screen parameter flag or the attribute signal of an image.

[0050] Furthermore, the image-processing section 21 is formed in the server in which it was prepared on the network 3, and an image processing is requested to a server, and after a host computer 1 performs the above image processings in a server, it can also be constituted so that an image may be transmitted to a printer 2. Even if a network 3 is not only LAN etc. but the Internet, it is easy to be natural [ a network ].

[0051] In each above-mentioned example, although reference is not made especially about the unit which changes the screen parameter by the screen parameter flag, it can change for every object, for example. However, by the printer of low cost, if the screen parameter for every object

is changed, a processing load may increase, or a tone reproduction may be influenced. Therefore, a screen parameter can also be changed, for example in predetermined units, such as 1 job unit and a 1-page unit. In this case, the case where two or more line objects exist in that unit is assumed. In such a case, it is possible to take statistics based on the drawing direction and the maximum color of a segment, and to set up a screen parameter flag from the statistic. What is necessary is just to control the screen parameter to be used, taking into consideration various elements [ , such as performing weighting according to how being conspicuous, or performing weighting according to the danger of disappearance ], such as length, concentration, etc. at this time, for example, a segment.

[0052] Drawing 9 is explanatory drawing of an example of a storage which stored the computer program in the case of performing processing performed in the image processing system of this invention by the computer program. the inside of drawing, and 101 -- a program and 102 -- a computer and 111 -- for a magnetic disk and 114, as for optical-magnetic disc equipment and 122, memory and 121 are [ a magneto-optic disk and 112 / an optical disk and 113 / an optical disk unit and 123 ] magnetic disk drives.

[0053] Processing currently performed in the image-processing section 21 at least in each above-mentioned example can be realized also by the program 101 which can be executed by computer. In that case, the data which the program 101 and its program use can also be memorized to the storage which a computer can read. To the reader with which the hardware resources of a computer are equipped, according to the content of description of a program, a storage causes the change condition of energy, such as MAG, light, and electrical and electric equipment, and can transmit the content of description of a program to a reader in the form of the signal corresponding to it. For example, they are a magneto-optic disk 111, an optical disk 112, a magnetic disk 113, and memory 114 grade. Of course, these storages are not restricted to a portable mold.

[0054] By storing the program 101 in these storages, for example, equipping with these storages the optical-magnetic disc equipment 121 of a computer 102, an optical disk unit 122, a magnetic disk drive 123, or the memory slot that is not illustrated, a program 101 can be read from a computer and processing in the above image-processing sections 21 can be performed. Or the computer 102 is beforehand equipped with the storage, for example, a program 101 may be transmitted to a computer 102 through a network (LAN and the Internet are included) communication path, and a storage may be made to store and execute a program 101. Of course, when the function of an image processing system is divided into a host computer 1 and a printer 2 as mentioned above, it is stored in another storage for every processing performed in each equipment, and you may constitute so that each equipment may be loaded and it may function as a whole.

[0055]

[Effect of the Invention] According to this invention, about the maximum color of the color-material colors which constitute a segment, a screen parameter is controlled and screen treatment is performed so that screen treatment may be performed at a different screen angle from the drawing direction of a segment, so that clearly from the above explanation. Or when the drawing direction of a segment is the predetermined direction, a screen parameter is controlled and screen treatment is performed so that screen treatment of the maximum color may be performed at a different screen angle from the screen angle to the segment of other drawing directions. Disappearance of the segment by the drawing direction of a segment and interference of a screen angle especially a thin line, or a light-colored line is avoidable with this. A difference of a big color can be prevented by avoiding disappearance of a segment about the maximum color with it. Moreover, also when using which screen angle, by considering as the same screen ruling, tone-reproduction ability becomes uniform and can suppress generating of a rapid concentration gap etc. Furthermore, since a screen parameter is changed in order to prevent disappearance of a segment, it is not necessary to change about a color and a gradation amendment parameter, it becomes unnecessary to hold many parameters, such as huge color conversion and UCR, in memory, and memory cost is reduced, and it is effective in a good image quality rendering being attained, without performing large-scale object separation, and color

correction and screen treatment.

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[Translation done.]

**\* NOTICES \***

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1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.\*\*\*\* shows the word which can not be translated.

3.In the drawings, any words are not translated.

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**DESCRIPTION OF DRAWINGS**

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**[Brief Description of the Drawings]**

**[Drawing 1]** It is the outline block diagram showing an example of an image formation system including one gestalt of operation of the image formation equipment of this invention.

**[Drawing 2]** It is the block diagram showing an example of image formation equipment including one gestalt of operation of the image processing system of this invention.

**[Drawing 3]** It is the block diagram showing an example of the image-processing section.

**[Drawing 4]** It is the block diagram showing an example of processing to the segment in the image-processing section.

**[Drawing 5]** It is explanatory drawing of an example of a screen parameter.

**[Drawing 6]** It is the flow chart which shows an example of the actuation in a color, the gradation amendment processing section, and the screen treatment section.

**[Drawing 7]** It is explanatory drawing of an example of the setting-out method of the screen parameter in the structure judging section.

**[Drawing 8]** It is the block diagram showing an example of a host computer including one gestalt of operation of the image processing system of this invention.

**[Drawing 9]** It is explanatory drawing of an example of a storage which stored the computer program in the case of performing processing performed in the image processing system of this invention by the computer program.

**[Description of Notations]**

1 [ -- Application, ] -- A host computer, 2 -- A printer, 3 -- A network, 11 12 [ -- A color and the gradation amendment processing section, ] -- A driver, 21 -- The image-processing section, 22 -- The rasterization processing section, 23 24 -- The screen treatment section, 25 -- The printer engine section, 26 -- Laser actuator, 27 [ -- Photograph color converter, ] -- The marking section, 31 -- An alphabetic character and a \*\*\*\* converter, 32 -- The judgment section, 33 34 -- A graphics color converter, 35 -- An alphabetic character and the line screen treatment section, 36 -- The photograph screen treatment section, 37 -- Graphics screen treatment section, 41 [ -- A computer, 111 / -- A magneto-optic disk, 112 / -- An optical disk, 113 / -- A magnetic disk, 114 / -- Memory, 121 / -- Optical-magnetic disc equipment, 122 / -- An optical disk unit, 123 / -- Magnetic disk drive. ] -- The maximum color judging section, 42 -- The structure judging section, 101 -- A program, 102

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**[Translation done.]**

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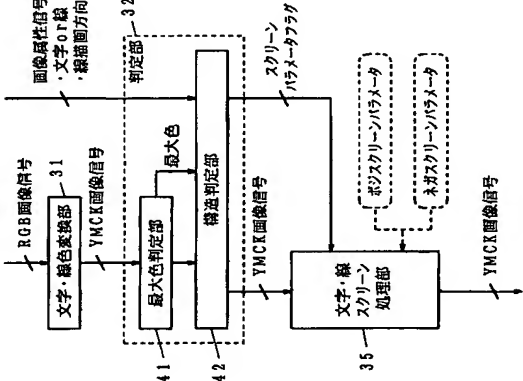
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(54) 【発明の名称】 画像処理装置、画像形成装置、記録媒体

(67) 【要約】  
【課題】 スクリーン処理による細線の消失を防止し、良好に再現可能な画像処理装置を提供する。  
【解決手段】 ラスタ化された画像信号に対して文字・線色変換部31で色材色への色変換を行った後、最大色判定部41において、線分の色を再現する色材色のうちから最大色を特定する。構造判定部42は、特定した最大色と線分の描画方向とから、文字・線スクリーン処理部35において線分の描画方向と異なるスクリーン角度で最大色のスクリーン処理が行われるように、スクリーンパラメータを制御するスクリーンパラメータフラグを出力する。文字・線スクリーン処理部35では、スクリーンパラメータフラグに従って、線分の描画方向と異なるスクリーン角のスクリーンパラメータを用い、画像に対してスクリーン処理を施す。これによって、スクリーン処理による線分の消失を回避することができる。



最終頁に続く

- (2) 特開2002-262113
- 【請求項1】 入力画像を構成する線分について該線分の色を再現するために使用される複数の色材の色のうちから消失を避けるべき色を最大色として特定する最大色判定手段と、前記最大色判定手段で特定された前記最大色と前記線分の描画方向に従ってスクリーンパラメータを制御する構造判定手段と、前記構造判定手段により制御されるスクリーン処理手段と、前記スクリーン処理手段でスクリーン処理を行った後の画像を画像形成媒体上に形成する画像形成手段とを有し、前記構造判定手段は、前記スクリーン処理手段において前記線分の描画方向と異なるスクリーン角度で前記最大色のスクリーン処理が行われるように前記スクリーンパラメータを制御することを特徴とする画像形成装置。
- 【請求項11】 入力画像を構成する線分について該線分の色を再現するために使用される複数の色材の色のうちから消失を避けるべき色を最大色として特定する最大色判定手段と、前記最大色判定手段で特定された前記最大色と前記線分の描画方向に従ってスクリーンパラメータを制御する構造判定手段と、前記構造判定手段によって制御された前記スクリーンパラメータに従ってスクリーン処理を行うスクリーン処理手段と、前記スクリーン処理手段でスクリーン処理を行った後の画像を画像形成媒体上に形成する画像形成手段とを有し、前記構造判定手段は、前記スクリーン処理手段において前記線分の描画方向と異なるスクリーン角度で前記最大色のスクリーン処理が行われるように前記スクリーンパラメータを制御することを特徴とする画像形成装置。
- 【請求項12】 前記構造判定手段は、前記スクリーンパラメータを制御する際に、前記線分が所定の角度より細い線分であるか否かの判定も行うことを特徴とする請求項10または請求項11に記載の画像形成装置。
- 【請求項13】 前記構造判定手段は、前記スクリーンパラメータを制御する際に、前記線分が所定の角度より細い線分であるか否かの判定も行うことを特徴とする請求項10または請求項11に記載の画像形成装置。
- 【請求項14】 前記最大色判定手段は、前記最大色の特定の際に黄色より他の色を優先することを特徴とする請求項10ないし請求項13のいずれか1項に記載の画像形成装置。
- 【請求項15】 前記スクリーン処理手段は、同一の解像度及び線数の複数のスクリーン角度によるスクリーン
- 【請求項1】 入力画像を構成する線分について該線分の色を再現するために使用される複数の色材の色のうちから消失を避けるべき色を最大色として特定する最大色判定手段と、前記最大色判定手段で特定された前記最大色と前記線分の描画方向に従ってスクリーンパラメータを制御する構造判定手段と、前記構造判定手段により制御されるスクリーン処理手段と、前記スクリーン処理手段でスクリーン処理を行った後の画像を画像形成媒体上に形成する画像形成手段とを有し、前記構造判定手段は、前記スクリーン処理手段において前記線分の描画方向と異なるスクリーン角度で前記最大色のスクリーン処理が行われるように前記スクリーンパラメータを制御することを特徴とする画像形成装置。
- 【請求項11】 入力画像を構成する線分について該線分の色を再現するために使用される複数の色材の色のうちから消失を避けるべき色を最大色として特定する最大色判定手段と、前記最大色判定手段で特定された前記最大色と前記線分の描画方向に従ってスクリーンパラメータを制御する構造判定手段と、前記構造判定手段によって制御された前記スクリーンパラメータに従ってスクリーン処理を行うスクリーン処理手段と、前記スクリーン処理手段でスクリーン処理を行った後の画像を画像形成媒体上に形成する画像形成手段とを有し、前記構造判定手段は、前記スクリーン処理手段において前記線分の描画方向と異なるスクリーン角度で前記最大色のスクリーン処理が行われるように前記スクリーンパラメータを制御することを特徴とする画像形成装置。
- 【請求項12】 前記構造判定手段は、前記スクリーンパラメータを制御する際に、前記線分が所定の角度より細い線分であるか否かの判定も行うことを特徴とする請求項10または請求項11に記載の画像形成装置。
- 【請求項13】 前記構造判定手段は、前記スクリーンパラメータを制御する際に、前記線分が所定の角度より細い線分であるか否かの判定も行うことを特徴とする請求項10または請求項11に記載の画像形成装置。
- 【請求項14】 前記最大色判定手段は、前記最大色の特定の際に黄色より他の色を優先することを特徴とする請求項10ないし請求項13のいずれか1項に記載の画像形成装置。
- 【請求項15】 前記スクリーン処理手段は、同一の解像度及び線数の複数のスクリーン角度によるスクリーン

処理を前記スクリーンパラーメータの制御により選択可能に構成されていることを特徴とする請求項10ないし請求項14のいずれか1項に記載の画像形成装置。

【請求項16】 前記スクリーン処理手段は、互いに隣接関係にあるスクリーン角度のいずれかを前記スクリーンパラーメータの制御により選択可能に構成されていることを特徴とする請求項10ないし請求項15のいずれか1項に記載の画像形成装置。

【請求項17】 前記構造判定手段は、各線分毎にスクリーンパラーメータの制御を行うことを特徴とする請求項10ないし請求項16のいずれか1項に記載の画像形成装置。

【請求項18】 前記構造判定手段は、各線分毎の判定結果を総合して入力画像に対するスクリーンパラーメータを設定することを特徴とする請求項10ないし請求項16のいずれか1項に記載の画像形成装置。

【請求項19】 入力画像を構成する線分について該線分の色を再現するために使用される複数の色材の色のうちから消失を避けるべき色を最大色として特定する最大色特定ステップと、前記最大色と前記線分の描画方向とに従って前記線分の描画方向と異なるスクリーン角度で前記最大色のスクリーン処理が行われるように前記スクリーンパラーメータを制御する構造判定ステップと、制御された前記スクリーン処理ステップをコンピュータに実行させるプログラムを記憶していることを特徴とする前記コンピュータが読み取り可能な記憶媒体。

【請求項20】 入力画像を構成する線分について該線分の色を再現するために使用される複数の色材の色のうちから消失を避けるべき色を最大色として特定する最大色特定ステップと、前記線分の描画方向が所定方向と異なるスクリーン角度で前記最大色のスクリーン処理が行われるように前記スクリーンパラーメータを制御する構造判定ステップと、制御された前記スクリーン処理ステップをコンピュータに実行させるプログラムを記憶していることを特徴とする前記コンピュータが読み取り可能な記憶媒体。

【請求項21】 前記構造判定ステップにおいて、さらに、前記線分が所定幅より細い線分であるか否かの判定を行い、該判定の結果も前記スクリーンパラーメータを制御する際に利用することを特徴とする請求項19または請求項20に記載の記憶媒体。

【請求項22】 前記構造判定ステップにおいて、さらに、前記線分が所定の濃度よりも濃度の薄い線分であるか否かの判定も行い、該判定の結果も前記スクリーンパラーメータを制御する際に利用することを特徴とする請求項19ないし請求項21のいずれか1項に記載の記憶媒体。

【請求項23】 前記最大色特定ステップにおいて、前記最大色を特定する際に黄色より他の色を優先することとを特徴とする請求項19ないし請求項22のいずれか1項に記載の記憶媒体。

【請求項24】 前記構造判定ステップでは、同一の解像度及び線数の複数のスクリーンパラーメータの制御により選択を行うことを特徴とする請求項19ないし請求項23のいずれか1項に記載の記憶媒体。

に応じて、所定の大きさを微小領域中の描画面積を変化させることによって、画像全体における濃淡を演出させる方法である。例えば淡い部分では微小領域中の1ないし数点のみが描画され、そのような点が散在することによって、画像全体として淡い階調を表現することになる。

【0005】しかし、淡い色の場合に描画されるのは微小領域中のごく一部であり、所定のパターンで描画された領域と描画されない領域とが交互に現れることになるため、淡い色の細線を描画しようとする。細線と描画パターンとの間で干渉が発生してしまう。特にスクリーン角度に近接する角度の淡い細線では、細線の延在方向に連続する多くの微小領域で細線が描画されず、画像全体として淡い細線が消失してしまうという問題がある。このような線の消失は、線が細いほど、また淡い色であるほど、さらにスクリーン角度に近い角度の線であるほど、発生しやすい。

【0006】例えば特開平9-191403号公報には、入力された画像信号から線画を抽出し、線画の部分については解像度の高いスクリーンと階調補正用変換に切り替えることが記載されている。しかしこの文獻では、線画以外の部分の階調性を重視し、線画については解像度を重視するためにスクリーン形状やスクリーン線数などを切り替えているだけであり、細線などの消失防止するものではない。この文獻のように高解像度のスクリーンを用いることによって淡い細線の消失を防止するためには、基本解像度まで解像度を上げなければ100%の回復は無理であり、その場合、細線の色再現性は極端に低下してしまう。

【0007】また、例えば特開平9-282471号公報では、コントローラにおいて、PDLに記述された情報から画像毎の特性を取得し、その特性毎に画像処理を行う旨が記載されている。特に文字、線画及び輪郭などの解像度を必要とするオブジェクトには、TEXT信号フラグを設け、画像処理を切り替える。しかし、スクリーン処理については、TEXT信号フラグが付加された画像信号には400線、その他には200線のスクリーン処理を施すといったように、単に解像度を切り替えるのみである。このように解像度を切り替えるだけでは、上述のような細線の消失を防止することはできない。

【0008】さらに、例えば特開平9-294208号公報では、画像処理装置に入力された画像信号からエッジを検出して、エッジの状態に応じて、同じマスクサイズの複数のスクリーンパターンを切り替えることが記載されている。特に、エッジ以外はドット型で階調再現を安定化し、エッジ部には、異なるスクリーン形状でエッジを滑らかにしている。これによって、文字や線のエッジにおけるガタツキを滑らかにすることができ。しかしこの場合も、スクリーン角度に近い角度の細線が消失してしまうような場合に対しては効果がなく、細線の

消失を防止することはできない。

【0009】  
【發明が解決しようとする課題】 本発明は、上述した事情に鑑みながされたもので、細線の消失を防止し、良好に再現可能な画像処理装置及び画像形成装置と、そのような画像処理をコンピュータに実行させるプログラムを格納した記憶媒体を提供することを目的とするものである。

【0010】

【課題を解決するための手段】 本発明では、まず、入力画像を構成する線分について、その線分の色を再現するために使用される複数の色材の色のうちから消失を避けるべき色を最大色として特定する。そしてその最大色と線分の描画方向に従ってスクリーンパラーメータの制御を行う。このとき、線分の描画方向と異なるスクリーン角度で最大色のスクリーン処理が行われるように、スクリーンパラーメータを制御する。これによって、制御されたスクリーンパラーメータに従ってスクリーン処理を行えば、少なくとも最大色については線分の描画方向と異なるスクリーン角度でスクリーン処理が行われるため、細線や色の薄い線などの消失を防止することができる。

【0011】あるいは、線分の描画方向が所定方向と異なるスクリーン角度に対するスクリーン角度とは異なるスクリーン角度で最大色のスクリーン処理が行われるように、スクリーンパラーメータを制御する。これによって、例えば通常のスクリーン角度では消失しやすい描画方向の線分については、少なくとも最大色については他の線分とは異なるスクリーン角度でスクリーン処理が行われるため、細線や色の薄い線などの消失を防止することができる。

【0012】上述のように細線の消失は、線分の幅が大きい場合にはあまり発生せず、また色が濃い場合にはあまり発生しない。従って、このようなスクリーン角度の変更は、線分が所定幅より細い線分である場合、あるいは、線分が所定の濃度よりも濃度の薄い線分である場合について、線分の描画方向が最大色に対応するスクリーン角度に近い場合に行うとよい。また、黄色はあまり目立たないため、他の目立つ色について消失を防止するよう、最大色を特定する際に黄色より他の色を優先するよう構成することができる。さらに、スクリーン角度の変更は、互いに隣接関係にあるスクリーン角度のいずれかを選択するようにすると、容易に構成することができ。また、選択するスクリーン角度は、同一の解像度及び線数の中で選択することにより、極端な階調変化や変位位置における濃度ギャップ等の画質劣化を防止することができる。

【0013】なお、スクリーン角度の変更は、例えば各線分毎に行ったり、あるいは、各線分毎の判定結果を総合して、入力画像全体について設定することができる。

【発明の実施の形態】図1は、本発明の画像形成装置の実施の一形態を含む画像形成システムの一例を示す概略構成図、図2は、本発明の画像処理装置の実施の一形態を含む画像形成装置の一例を示すブロック図である。図中、1はホストコンピュータ、2はプリンタ、3はネットワーク、11はアプリケーション、12はドライバ、21は画像処理部、22はラスター化処理部、23は色・階調補正処理部、24はスクリーン処理部、25はプリンタエンジン部、26はレーザ駆動部、27はマーキング部である。なおこの例では、本発明の画像形成装置は、本発明の画像処理装置を含んだ例を示している。

【0015】図1に示した画像形成システムは、ホストコンピュータ1とプリンタ2から構成され、ネットワーク3によって両者が接続されている。また、このネットワーク3を介して他のコンピュータなどの機器から、形成すべき画像が送られてくる場合もある。さらに、図示しない電話回線などの通信回線を介して、形成すべき画像が送られてきてよい。

【0016】この例では、ホストコンピュータ1には、文書や画像などを作成するアプリケーション11と、プリンタ2において形成する画像を、プリンタ2が解釈可能な形式に変換してプリンタ2に転送するためのドライバ12が設けられている。アプリケーション11で作成された原稿は、被記録媒体上への画像形成が必要になつたとき、ドライバ12に転送される。ドライバ12に転送された原稿は、例えばベージ記述言語(PDL)に変換される。このベージ記述言語による記述の中には、実際に形成すべき画像(オブジェクト)の情報とともに、そのオブジェクトの属性情報が付加されている。

【0017】プリンタ2は、画像処理部21とプリンタエンジン部25を有している。画像処理部21は、ホストコンピュータ1から送られてくるベージ記述言語を解釈し、各種の画像処理を施して、プリンタエンジン部25において最良の画像の形成が可能な画像信号を生成する。このとき、同じくホストコンピュータ1から送られてくる画像属性情報に応じて、各属性の画像に最適な画像処理を施す。プリンタエンジン部25は、実際に被記録媒体上に画像を形成する。

【0023】図3は、画像処理部の一例を示すブロック図である。図中、31は文字・緑色変換部、32は判定部、33は写真色変換部、34はグラフィックス色変換部、35は文字・緑スクリーン処理部、36は写真スクリーン処理部、37はグラフィックススクリーン処理部である。画像処理部21は、ベージ記述言語を受け取る。と、それぞれのオブジェクトの属性毎に処理を行う。ラスタ化処理部22ではそれぞれのオブジェクトについてラスタライズし、その属性の情報を画像属性信号として色・階調補正処理部23に渡す。図3では、説明を簡単にするため、それぞれの属性毎に処理の流れを分けて図示している。また属性として文字・緑、写真、グラフィックスの3種類を示している。もちろん、このほかの属性があってもよく、少なくとも線の属性が区別できればよい。

【0024】属性が写真の場合には、写真色変換部33において写真に最適な色変換処理が施された後、写真スクリーン処理部36において写真に最適なスクリーン処理が施される。

【0019】プリンタ2に送られてきたPDLで記述さ

30、20、0)のブルーの線分であれば最大色としてM(マゼンタ)色を最大色として特定する。なお、最大色の特定の際には、Y(黄)色より他の色を優先するとよい。Y色は値が大きても目立ちにくく、他の色の消失を避けた方が、より好ましい結果が得られる場合がある。

【0029】階調判定部42は、文字・緑色変換部31から出力されたYCMCK色空間の画像信号を最大色判定部41を介して受け取る。とともに、同じく最大色判定部41で特定した最大色の情報を受け取り、さらに、ラスター化処理部22から出力される属性情報を受け取り、受け取った属性情報から文字・緑属性であることを確認するとともに、線分の描画方向を特定する。ここで、属性が線の場合には、その線分の描画方向と、最大色判定部41から受け取った最大色に従い、スクリーン処理部24において線分の描画方向と異なるスクリーン角度で最大色のスクリーン処理が行われるように、スクリーンパラメータを制御する。あるいは、線分の描画方向が例えば消失しやすい方向などの所定方向のとき、他の描画方向の線分に対するスクリーン角度とは異なるスクリーン角度で最大色のスクリーン処理が行われるように、スクリーンパラメータを制御する。

【0030】上述のように、スクリーン角と線分の描画方向が近いと、スクリーン処理時に線分が消失する可能性が高くなる。特に最大色については消失する線分自体が消失したり、あるいは他の色のみのみで描画されて全く異なる色で再現されるなどの不具合が発生される。従って、最大色と線分の描画方向に応じて、文字・緑スクリーン処理部35において行われるスクリーン処理におけるスクリーン角度が線分の描画方向と異なるように、スクリーンパラメータを制御する。あるいは、消失しやすい方向に線分が描画されるときには、文字・緑スクリーン処理部35において行われるスクリーン処理において他の描画方向の線分に対するスクリーン角度と異なるスクリーン角度で最大色のスクリーン処理が行われるように、スクリーンパラメータを制御する。

【0027】図4は、画像処理部における線分に対する処理の一例を示すブロック図である。図中、41は最大色判定部、42は階調判定部である。ラスター化処理部22で展開された属性が文字・緑であるオブジェクトのラスタメーザは、例えばRGB色空間の画像信号として色・階調補正処理部23の文字・緑色変換部31に入力される。そして文字・緑色変換部31において、文字や線分等に適した補正処理などを施し、さらに例えばYCMCK色空間などのプリンタエンジン部25で用いられる色からなる色空間の画像信号に変換する。変換された例えばYCMCK色空間の画像信号が判定部32の最大色判定部41に入力される。

【0028】最大色判定部41では、特に線分の色を再現するために使用されるそれぞれの色材の色のうちから、スクリーン処理時に消失を避けるべき色を最大色として特定する。スクリーンと線分の干渉は、いずれの色材色とも発生する可能性があるが、最も目立つ色について消失を避けることによって、その効果を発揮させることができる。最大色としては、例えば色材色がY、M、C、Kの4色である場合、線分のY、M、C、Kの値のうち、最も大きい値の色(YMCKのいずれか)とすることができ。例えば(Y、M、C、K) = (0、

消失する可能性が高い場合として、線分が細い場合

や、色が淡い場合が挙げられる。そのため、例えば属性番号から線分の幅が所定値より細い線分について、上述のようなスクリーン角を変更するスクリーンパラメータの制御を行う対象とすることができる。また、例えば線分の濃度が所定の濃度より薄い線分について、上述のようなスクリーン角を変更するスクリーンパラメータの制御を行う対象とすることができる。もちろん、これらの条件を組み合わせることも可能である。

【0032】文字・線スクリーン処理部35には、構造判定部42を介して画像信号を受け取るとともに、同じく構造判定部42から送られてくるスクリーンパラメータフラグを受け取る。そして、スクリーンパラメータフラグによる制御に従って、異なるスクリーン角のスクリーンパラメータのうちのいずれかを選択し、画像信号に対してスクリーン処理を施して出力する。図4では、選択されるスクリーンパラメータとしてポジスクリーンパラメータ、ネガスクリーンパラメータの2種類を示し、いずれかを選択するものとして示している。もちろん、3種類以上のスクリーンパラメータが選択可能に存在していることもよい。

【0033】図5は、スクリーンパラメータの一例の説明図である。スクリーン角を異ならせるため、例えば互いに鏡像関係にあるスクリーン角度となるようなパラメータを設定しておくことができる。図5では異なる2度のスクリーンパラメータについて、そのスクリーン角度を太線で示して示している。図5(A)に示すスクリーンパラメータの例では、Y、C、M、Kのスクリーン角度がそれぞれ150°、120°、60°、30°と異なるように設定している。また図5(B)に示すスクリーンパラメータの例では、図5(A)に示すスクリーン

【0039】属性の信号が文字及び線である場合には、S56において文字・線色変換部31で文字や線分の色変換や色補正の処理を行った後、S57において属性が文字か線かを判定し、文字であればS58においてスクリーン処理部24で文字用のスクリーンパラメータを用いてスクリーン処理を行う。

【0040】また属性が線である場合には、S59において、線分の色を構成する色材色のうち、最大の値を有する色(最大色)を最大色判定部41で取得する。例えば色材色がY、M、C、Kであれば、そのいずれかの色となる。このとき、値が大きくてもあまり目立たないY色よりも他の色を優先させて最大色とすることもできる。例えばY成分のみの場合にはYを最大色とし、2次色以上で他の色成分が所定以上含まれている場合にはYが最大値であっても他の色の中から最大色を選択するようにすることができる。

【0041】次にS60において、構造判定部42は、S59で取得した最大色と線分の描画方向とからスクリーン角を変更するか否かを判定して、適切なスクリーン角によりスクリーン処理が行われるようにスクリーンパラメータを設定している。

【0042】文字・線スクリーン処理部35には、構造判定部42を介して画像信号を受け取るとともに、同じく構造判定部42から送られてくるスクリーンパラメータフラグを受け取る。そして、スクリーンパラメータフラグによる制御に従って、異なるスクリーン角のスクリーンパラメータのうちのいずれかを選択し、画像信号に対してスクリーン処理を施して出力する。図4では、選択されるスクリーンパラメータとしてポジスクリーンパラメータ、ネガスクリーンパラメータの2種類を示し、いずれかを選択するものとして示している。もちろん、3種類以上のスクリーンパラメータが選択可能に存在していることもよい。

【0033】図5は、スクリーンパラメータの一例の説明図である。スクリーン角を異ならせるため、例えば互いに鏡像関係にあるスクリーン角度となるようなパラメータを設定しておくことができる。図5では異なる2度のスクリーンパラメータについて、そのスクリーン角度を太線で示して示している。図5(A)に示すスクリーンパラメータの例では、Y、C、M、Kのスクリーン角度がそれぞれ150°、120°、60°、30°と異なるように設定している。また図5(B)に示すスクリーン

ンパラメータフラグを設定する。そしてS61において、スクリーン処理部24はS60で設定したスクリーンパラメータフラグによってスクリーンパラメータを選択し、線用のスクリーン処理を行う。

【0042】図7は、構造判定部におけるスクリーンパラメータの設定方法の一例の説明図である。図7に示す例では、最大色判定部41で取得した最大色と、線分の描画方向からスクリーン角を設定する場合の設定方法を示しており、スクリーンパラメータの種別の「ポジ」は図5(A)に示すポジスクリーンパラメータを選択する

【0043】このようにして、最大色と線分の描画方向とから、線分が消失しないようにスクリーンパラメータを設定することができる。これによって、描画する線分とスクリーン処理との干渉による線分の消失を回避することができる。また、このとき同じスクリーン線数のスクリーンを切り替えて使用することによって、階調再現の急激な変化や切り替え位置にギャップが発生することなく、良好な色再現を実現することができる。さらに、色・階調補正処理部23における色変換やガンマ補正処理などの各種の処理については切り替えが不要なため、コストを削減し、またパフォーマンスの低下を抑制することができる。なお、最大色以外ではスクリーン角と線分の描画方向とが近くなってしまいう場合もあるが、最大色が消失するよりは影響が小さい。

【0044】図7に示すようなスクリーンパラメータの選択は、すべての線分にに対して行う必要はなく、例えば予め図5に示すいずれかを選択しておき、線分の幅が所定は荒価の場合あるいは線分の色が所定の濃度以下の場合に図7に示すような選択を行うように構成することができる。例えば線分の幅が0.25ポイント以下の線分

【0047】アプレケーション11で作成された原稿は、被記録媒体上への画像形成が必要になったとき、ドライバ12に転送される。ドライバ12に原稿が転送されると、ドライバ12はプリンタ2で画像を形成するための種々の処理を行う。その処理の一部として、画像処理部21においてラスタ化処理部22におけるラスタ化処理、色・階調補正処理部23における色変換処理や階調補正処理、スクリーン処理部24におけるスクリーン処理などを行う。このような処理の中で、上述のように線分に關しては最大色を取得し、その最大色と線分の描画方向とからスクリーンパラメータを制御し、スクリーン処理部24において線分の描画方向と異なるスクリーン処理が施された画像を、プリンタ2に転送する。

【0048】この構成の場合には、ホストコンピュータ1からプリンタ2へラスタデータが転送されることになり、もちろん図1に示したようにネットワーク3を介して転送する場合もあるが、例えば各種のパラレルインターフェースやシリアルインターフェースを用いてホストコンピュータ1とプリンタ2とがケーブルにより直結するよ

【0049】図2においては画像処理部21の全体をプリンタ2側に設け、また図8においてはホストコンピュータ1のドライバ12に設けた。本発明はこれらの例に限らず、例えば画像処理部21の一部をホストコンピュータ1のドライバ12に設け、そのほかの部分を実行部22に設けるといった構成も可能である。例えばスクリーン処理部24をプリンタ2に、色・階調補正処理部23まではドライバ12に設けるといったことも可能である。この場合、スクリーンパラメータフラグや画像の属性番号などについてもホストコンピュータ1からプリンタ2へ転送すればよい。

【0044】図7に示すようなスクリーンパラメータの選択は、すべての線分にに対して行う必要はなく、例えば予め図5に示すいずれかを選択しておき、線分の幅が所定は荒価の場合あるいは線分の色が所定の濃度以下の場合に図7に示すような選択を行うように構成することができる。例えば線分の幅が0.25ポイント以下の線分

をスクリーンパラメータの選択対象とすることができる。

【0045】また、選択可能なスクリーンパラメータは、図5に示した鏡像関係以外にも、線分が消失する角度以外の角度に回転させたスクリーン角によるスクリーン処理が行われるスクリーンパラメータを用意しておくことができる。例えば90度あるいは270度回転させたスクリーン角を採用してもよい。スクリーン形状は任意であり、スクリーン角を制御しやういラインスクリーンのほか、ドットスクリーンなど、種々のスクリーン形状を適用可能である。

【0046】図8は、本発明の画像処理装置の実施の一形態を含むホストコンピュータの一例を示すブロック図である。図中の符号は図1、図2と同様であり、重複する説明を省略する。この例では、本発明の画像処理装置を、ホストコンピュータ1のドライバ12に組み込んだ例を示している。

【0047】アプレケーション11で作成された原稿は、被記録媒体上への画像形成が必要になったとき、ドライバ12に転送される。ドライバ12に原稿が転送されると、ドライバ12はプリンタ2で画像を形成するための種々の処理を行う。その処理の一部として、画像処理部21においてラスタ化処理部22におけるラスタ化処理、色・階調補正処理部23における色変換処理や階調補正処理、スクリーン処理部24におけるスクリーン処理などを行う。このような処理の中で、上述のように線分に關しては最大色を取得し、その最大色と線分の描画方向とからスクリーンパラメータを制御し、スクリーン処理部24において線分の描画方向と異なるスクリーン処理が施された画像を、プリンタ2に転送する。

【0048】この構成の場合には、ホストコンピュータ1からプリンタ2へラスタデータが転送されることになり、もちろん図1に示したようにネットワーク3を介して転送する場合もあるが、例えば各種のパラレルインターフェースやシリアルインターフェースを用いてホストコンピュータ1とプリンタ2とがケーブルにより直結するよ

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